



Is participatory watershed development building local adaptive capacity? Findings from a case study in Rajasthan, India

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ABSTRACT

Watershed development has emerged as a crucial intervention to strengthen natural resource-based livelihoods in semi-arid areas in India. It has evolved from an infrastructure-heavy, top-down approach, into an increasingly participatory process aimed at building rural adaptive capacity to deal with climate change and other risks such as water scarcity and natural resource degradation. However, the efficacy of watershed development initiatives in building local adaptive capacity has not matched intention, and farmers remain exposed to unpredictable water supply. Against this backdrop of inadequate alignment between policy intention and outcomes, this paper examines whether participatory watershed development, as it is currently implemented, contributes to building farmer adaptive capacity. A case study of a watershed project in southern Rajasthan is used as an illustrative example. The findings demonstrate that watershed interventions focussed on hard adaptation options such as building check dams without a matching emphasis on soft adaptation approaches such as building inclusive institutions or incentivising sustainable resource use. In practice, community participation often reinforced existing power and gender- and caste-based hierarchies, raising questions of who benefits from participatory watershed projects and to what degree. Several non-project, macro-scale factors such as corruption and continued policy focus on water supply augmentation were found to undermine positive impacts of the watershed project. These findings suggest that without adequate empowerment, expectations that community participation will augment rural livelihoods, restore water-stressed ecosystems, and build adaptive capacity to climatic risks were found to be rhetorical. Thus, the study calls for a restructuring of watershed implementation that includes both hard and soft adaptation approaches, and allows for strategies that first empower and then engage communities in livelihood strengthening and resource stewardship.

1. Introduction

Sixty per cent of agriculture in India is rainfed and depends on the highly erratic south-west monsoon. Rural livelihoods are inextricably linked to natural resources, and water availability is a crucial determinant of agricultural productivity. Recognising this, several nation-wide Watershed Development Programmes (WDPs) were launched in the 1970s towards drought proofing and sustainable resource management (Kolavalli and Kerr, 2002; Joshi et al., 2008). Subsequent initiatives focussed on participatory watershed development with an emphasis on livelihood generation and ecological restoration (Ratna Reddy, 2004). Despite this sustained policy focus on water management, and more recently, climate change adaptation (MoEF 2012), India's agrarian population

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remains poorly equipped to effectively cope with unpredictable water supplies (GoI, 1994).

In Rajasthan, a semi-arid, water-scarce state in northwest India, erratic rainfall patterns, falling groundwater levels, land degradation, food insecurity, and income poverty challenge rural livelihoods (TERI, 2010). Climate change is poised to exacerbate water scarcity, with regional predictions of more erratic precipitation, rising temperatures, and increasing evapotranspiration (Mall et al., 2006; Ajai et al., 2009; Singh et al., 2010). Consequently, Rajasthan has received sustained policy attention and financial inflow towards drought proofing, watershed development, and livelihood strengthening.

More recently, watershed development has been hailed as a mechanism to build local adaptive capacity to climate change (Gray and Srinidhi, 2013). However, its efficacy in building local capacity to manage natural risk is debatable (Bokil, 2000; Kolavalli and Kerr, 2002; Narayanan and Kamath, 2012). Identifying this gap between policy intention and outcome, this paper interrogates whether participatory watershed development, in its current form, contributes to local adaptive capacity and adaptation processes.

1.1. Watershed development as an instrument for natural resource management (NRM)

Recognising the criticality of water as an input in agriculture, over the centuries, Indian rulers, conquerors, and subsequently, governments have implemented several water management projects (Table 1). While pre-colonial rulers focussed on producing food and constructing storage and recharge structures (MoA, 2007), colonial rule disbursed gratuitous relief, constructed large-scale irrigation projects, and provided short-term employment on public works to address recurrent famines. These relief-oriented efforts fostered dependence and undermined traditional community-based response strategies (MoA, 2007; Narain et al., 2010). After independence, Nehruvian policies concentrated on building irrigation capacity, while policymakers continued relief-oriented schemes (e.g. Food for Work programmes) to mitigate drought impacts.

In the 1970s, three nation-wide WDPs, Integrated Wastelands Development Programme (IWDP), Drought Prone Areas Programme (DPAP), and Desert Development Programme (DDP), were launched to address rural poverty and improve livelihoods (Ratna Reddy, 2004; Singh et al., 2010). They were typically government-led, pre-planned, structural interventions that confined participation to informing and convincing targeted beneficiaries of the project's positive outcomes (GoI, 2006). In 2008, they were consolidated into the Integrated Watershed Management Programme (IWMP) to reduce redundancy, optimise resource use, introduce flexibility, emphasise capacity building, and ensure sustainable outcomes (MoRD, 2010). However, gaps remain. While the IWMP centralises the role of community involvement in project implementation, decision-making, and maintenance, it fails to overcome social differences based on caste, gender, and class effectively (Chaudhari and Mishra, 2016).

Over the past four decades, watershed development policy in India has seen multiple revisions, leading to nine different guidelines with varying forms of implementation (Table 1). Growing problems of inequitable and inadequate outcomes in WDPs and failure to simulate previous success stories such as Ralegaon Siddhi (Maharashtra) and Sukhomajri (Punjab) necessitated several

Table 1
Chronology of watershed management in India.

Year	Watershed policy
1970–71	Rural Works Programme (RWP) aimed at asset creation (construction of ponds, roads, and soil and water conservation structures) to mitigate drought impacts. Covered 54 districts (12% of country's population and one-fifth of its geographical area).
1973–74	RWP re-designated as Drought-Prone Areas Programme (DPAP), which used an integrated area development approach, i.e. drought proofing by increasing crop and livestock productivity. Technical focus with negligible community participation.
1977–78	Desert Development Programme (DDP) launched in hot desert areas (Rajasthan, Gujarat, and Haryana) and cold deserts (Jammu and Kashmir and Himachal Pradesh). Aimed at controlling desertification through NRM and increasing regional income and employment opportunities.
1983–84	Integrated Wasteland Development Programme (IWDP) launched for wasteland development on watershed basis.
late 1980s	DPAP expanded to 627 blocks in 96 districts in thirteen states. Evolved into a programme for watershed development focusing on soil conservation, water harvesting, pasture development, and afforestation, and to a small extent, livestock development, sericulture, and horticulture.
1990	National Watershed Development Programme of Rainfed Areas (NWDPA) launched covering 99 districts in 16 states aimed at improving productivity in rainfed areas.
1994–95	Government-elicited expert review recommends more participatory approach, exclusion of 245 existing blocks, inclusion of 384 new blocks, and change in expenditure norms.
1995–96	Government accepts recommendations. DPAP revised to cover 947 blocks in 164 districts, DDP covers 227 blocks in 40 districts. Guidelines for Watershed Development with a thrust on participatory approaches adopted. Villagers could now work with project-implementing agencies (government, non-government, or private).
1999	Changes in funding pattern from 50:50 between Central and State Governments to 75:25. Creation of a Watershed Development Fund with the National Bank for Agriculture and Rural Development (NABARD) to unify multiple watershed programmes into a single national initiative.
2001	Guidelines for Watershed Development revised to ensure transparency and suitability for local requirements.
2003	Guidelines further revised and named 'Haryali Guidelines'. More engagement of Panchayat Raj Institutions (PRIs) in planning, implementation, and management of rural development projects including watershed development.
2006	Government evaluation reports neglect of dryland agriculture and no increase in irrigated agriculture.
2008–09	All three schemes (DDP, DPAP, and NWDPA) consolidated into Integrated Watershed Management Programme (IWMP). Common Watershed Development Project Guidelines (<i>Neeranchal</i>) formed. Emphasises further decentralisation, an orientation towards sustainable livelihoods, and expanded project duration to 4–7 years.
2012	New government committee reduces project duration to five years, earmarks 1% funds for institution building, modifies ridge-to-valley approach, which negatively affects community participation. For the first time, the guidelines explicitly add promotion of climate change adaptation strategies in their objectives.

revisions, with a shift towards decentralisation, participatory resource management, and greater civil society involvement (Kolavalli and Kerr, 2002; Hope, 2007; GoI, 2008; Chaudhari and Mishra, 2016). Participatory approaches were promoted to reduce professional biases, incorporate local knowledge, and increase community ownership over project infrastructure and institutions (Joshi et al., 2008; Samra and Sharma, 2009; Gupta, 2014; Sinha, 2015). However, these efforts varied in their degree of participation (Kolavalli and Kerr, 2002; GoI, 2006; Samra and Sharma, 2009; Mollinga, 2010) and community participation was often negligible or absent (Sivanna, 2009).

Simultaneously, the nature of NRM through watershed development evolved. In the 1980s and early 1990s, there was a marked shift towards community-based NRM, where the community was seen as most ‘fit’ to manage common resources such as forests, pasturelands, and village ponds (Currie-Alder, 2007; Chhotray, 2007; Gupta, 2014). The second shift was post liberalisation (in 1995–96), where privately owned lands became sites of individual resource management (Daftary, 2014) through interventions such as farm ponds and agroforestry. When seen through the lens of adaptation, these shifts had two implications.

First, commons such as ponds and pasturelands saw extractive use. Even community-led initiatives were prone to elite capture and did not necessarily challenge existing social hierarchies. Decreased fodder for animals, differential water access for farming, and increased conflict over resources directly impacted generic adaptive capacities (capacities that contribute to overall human development) such as farm incomes, local resource stewardship, and social cohesion. Second, this individualisation undermined the potential of watershed development in building specific adaptive capacity (i.e. the ability to deal with increased climate variability and climate change) by inadvertently promoting individual-led extractive water use and focussing more on increasing supply rather than reducing demand (Bharucha et al., 2014).

1.2. Participation as a process to deliver watershed programmes

Participation as a mechanism to ‘deliver’ development that is more inclusive has a rich conceptual lineage. Originating from radical politics, which made demands for greater local participation in development planning (Agrawal and Gibson, 1999; Chhotray, 2004), it led to calls for inclusion of ‘southern’ voices to challenge hegemonic Western development paradigms (Escobar, 2011). However, poor results from decades of participatory approaches led contemporary researchers to argue that it was ‘tyrannical’ (Cooke and Kothari, 2001:2), represented ‘development orthodoxy’ (Cornwall, 2003:1325), exacerbated existing social inequities such as along lines of gender (Agarwal, 2001), and did not engage with critical informal institutions that mediate environment-society relationships (Agrawal and Gibson, 1999; Leach et al., 1999; Kumar and Corbridge, 2002).

In reality, participation can be of varying degrees, as described in Arnstein’s (1969) provocative ‘ladder of citizen participation’. It can range from non-participation (people being informed or manipulated) to tokenism (being consulted or placated) to empowerment (through collaboration and delegation of power). In NRM, these forms and processes of participation have critical implications on meeting goals of livelihood strengthening and resource stewardship.

In India, participatory NRM has been heralded as a way of “restructuring the power relations among the central, state and local governments and communities through the transfer of management authority to local-level organisations” (Sivanna, 2009:1). In WDPs especially, participation is seen as crucial to sustainable and equitable implementation because “individual choices have collective consequences” (Joshi et al., 2008:10), and adverse action by one stakeholder group can jeopardize positive action by others (Chhotray, 2007). Thus, India’s WDP guidelines centralise community participation through three village-level institutional arrangements: Self Help Groups (SHGs), Watershed Committees (WCs) and User Groups (UGs) and make them closely associated and accountable to the *Gram Sabha* (village forum) (GoI, 2008).

Over time, participation in WDPs has become as much a vehicle of inclusion and implementation as an invocation of imagery. It invokes the image of the ‘ideal’ community through notions of *shramdaan* or voluntary labour (Sangameswaran, 2008), the ‘ideal’ watershed through incentives for ‘*adarsh*’ (model) watersheds (Prasad et al., 2005), and a technocratic, depoliticised and hence ‘modern’ form of development (Chhotray, 2004, 2007). However, such narratives fail to account for historically embedded socio-economic inequities (Kumar and Corbridge, 2002) and how multiple, often-conflicting aspirations mean that there are multiple views of what is ‘ideal’. Moreover, in the construction of this ideal, the elite often consolidate their dominance and appropriate project benefits (Chhotray, 2004), and the weak contribute labour to intensive and often exploitative *shramdaan* (Sangameswaran, 2008).

Interestingly, the Watershed Guidelines (GoI, 2008; GoI 2011) do not clearly define what they mean by participation, and it thus remains a fuzzy concept, broad enough to encompass community involvement, ownership, and empowerment but ambiguous enough to pass off token involvement as participation. Thus, the guidelines do not fully harness the emancipatory power of participation (Lahiri-Dutt and Wasson, Wani et al., 2008, 2008).

1.3. Local adaptive capacity, adaptation, and watershed development

People dependent on natural resources for their livelihoods plan for and respond to climate variability and change regularly. These responses include trade-offs made to reduce risk from other multi-scale, interlinked social, economic, and institutional dynamics. Overall, household responses can be conceptualised to fall along a *response continuum* (Singh et al., 2016): from no response to short-term coping strategies at one end, and more permanent, long-term behavioural change signifying adaptation at the other.

Coping refers to short- or medium-term strategies that use available skills, resources, and opportunities when encountering external stresses and shocks (Ellis, 1998). Adaptive capacity on the other hand is the ‘ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences’ (IPCC, 2014). Adaptation strategies can be hard (infrastructure-heavy and relatively irreversible) or soft (institutional or financial strategies,

Table 2
Types of adaptation strategies.
Source: Author analysis

Adaptation strategies	Hard options	Soft options
Generic capacity	Green fencing to reduce soil erosion.	Capacity building of women's self-help groups with the aim of empowerment.
Specific capacity	Building check dams in response to increased likelihood of erratic rainfall.	Training farmers on the use of seasonal and longer-term climate forecasts to prepare for increased climate variability.

cognitive shifts) (Hallegatte, 2009; Jones et al., 2012; Boyd, 2017). These strategies can either build generic capacities that contribute to human development, or specific capacities related to climatic risks (Eakin et al., 2014). Table 2 explains these types of adaptation strategies in the context of watershed development.

Studies on the potential of WDPs in building and strengthening local adaptive capacity (Singh et al., 2015; Gray and Srinidhi, 2013) typically use economic frameworks and numerical indicators to capture 'success' through reports of crop loss averted by increased water availability or numbers of women organised into Self-Help Groups. However, such assessments do not capture whether WDPs enable changes in normative behaviour (e.g. efficient water use), which is essential to long-term adaptation.

Recognising this gap, I use the case of a WDP in Rajasthan, India, to examine whether participatory watershed development, as conceptualised and implemented in its current form, is helping build local adaptive capacity. In the remainder of the paper, I describe the study site and methodology, followed by the results sorted by WDP outcomes on adaptive capacity. The paper closes with a discussion on the implications of these findings on three facets of watershed development: participatory NRM, project sustainability, and local adaptation.

2. Study site

This study was conducted in Rajasthan, a drought-prone state in northwest India, which supports 5.5% of India's population and 10.13% of its livestock but shares only 1.15% of the country's water resources (GoR, 2002). With climate change poised to exacerbate existing vulnerabilities, Rajasthan is expected to slip into absolute water scarcity by 2045 (TERI, 2010). Within Rajasthan, Pratapgarh district (Fig. 1) was selected because it provided an opportunity to understand how climatic factors, socio-economic dynamics, and external interventions (in the form of participatory WDPs) interact to shape local vulnerability and adaptation. Pratapgarh was also chosen because of the paucity of research in southern Rajasthan as compared to the drier northwestern parts of the state (Singh, 2014). Although southern Rajasthan is relatively water-rich, it has a significant tribal population, and this provided an entry into understanding how historical socio-political marginalisation interfaces with more recent risks such as increased climate variability to shape local adaptation.

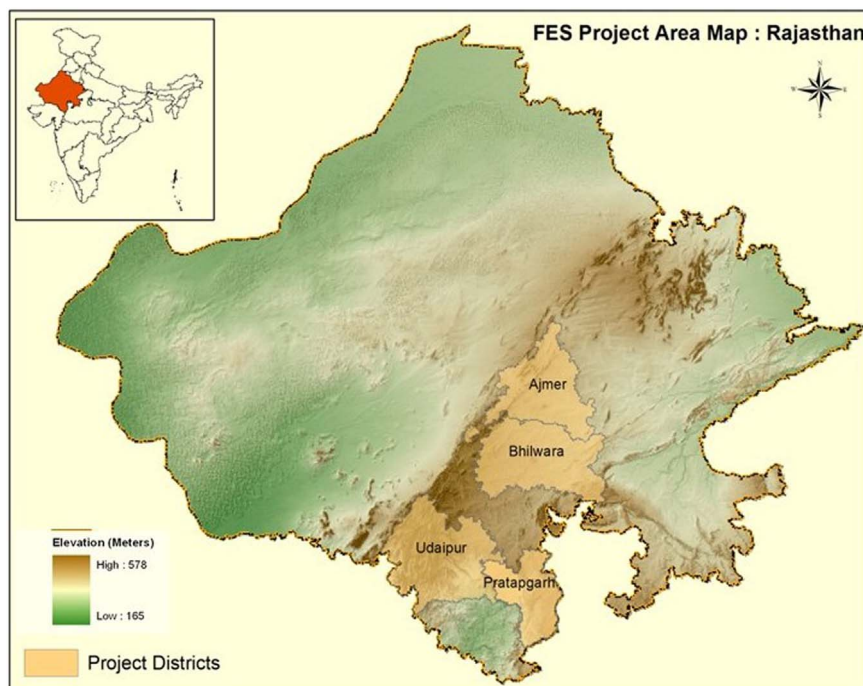


Fig. 1. Map of Rajasthan showing Pratapgarh district. Source: Foundation for Ecological Security, Pratapgarh Field Office

Table 3

Details of hamlets studied (N = total households in the hamlet).

Source: Key informant interviews and local NGO documents.

Name of village (code)	Meaning in English	N	Average landholding/ household (ha)	Soil type	Accessibility and road networks
Jambuda (J)	Where <i>jamun</i> trees grow	22	0.57	Black soil	1–1.5 km to road head
Kerwas (K)	–	13	0.45	Black soil	1–1.5 km to road head
Nai Abadi (NA)	New settlement	13	0.45	Black soil	3 km from road head
Neelkanth Mahadev (NM)	Temple of Shiva	23	0.53	Black and red soil	3–4.5 km from road head, limited access to markets
Chhota Pathaar (CP)	Small stony plateau	13	0.53	Plateau with rocky surface, less soil fertility (brown soil)	6 km from road head
Kerwas Pathaar (KP)	Stony plateau of Kerwas	25	0.44	Plateau with rocky surface, less soil fertility (brown soil)	7–8 km from road head
Hamakhora (HK)	In front of the jungle	24	0.32	Stony red soil	In valley, sloping land, 9–10 km from road head. Faces flooding.

Within Pratapgarh, an NGO-implemented WDP operational since 2006 was chosen. This watershed was representative of the biophysical and socio-economic variability in Pratapgarh and comprised seven villages. The population was predominantly tribal (90% Meena tribals) with 10% Rajputs (former ruling class) (Table 3).

The WDP falls under the Indo-German Watershed Development Programme (IGWDP) implemented through public-private partnership (PPP). The main actors are the National Bank for Agriculture and Rural Development (NABARD) as the funding partner (60% funds), the Indian Tobacco Company Limited (ITC) as the private stakeholder (40% funds), and the Foundation for Ecological Security (FES) as the project implementing agency. Watershed development falls under ITC's Mission *Sunehra Kal* (The Golden Tomorrow) which encompasses (1) NRM through integrated watershed development; (2) sustainable livelihood generation through livestock improvement and economic empowerment of women; and (3) community development. ITC and FES were joint 'Project Facilitating Agencies' and have a proven record of successful watershed development in the region.

The project's first phase included a yearlong Capacity Building Phase to ascertain community interest and treated 170.5 ha of the intended watershed area. After this, the four-year project was implemented, targeting 1220 ha (505 ha forest, 480 ha agriculture and 235 ha non-arable land). The intended beneficiaries were 174 tribal families, with an emphasis on women and poorer households. From the onset, there was emphasis on equal participation, and collective and transparent decision-making (Table 4).

The watershed project also created three community-based institutions:

- Village Watershed Committee (VWC) at the micro-watershed level responsible for planning, implementation, monitoring, and maintenance of the WDP with seven male and six female members in the executive committee.
- Village Forest Protection Management Committee (VFPMC) at the Panchayat-level initiated by the Forest Department and

Table 4

Summary of aims of the study WDP.

Source: Project document analysis

Issue	Project aims	Interventions
Environmental		
Rainfed agriculture with mainly one monsoon season crop 80% small and marginal landholders with 3–6 months of food insecurity/year.	To strengthen village and watershed-level governance of natural resources	Soil and moisture conservation (SMC) measures in watershed area (contour trenches, stone contour bunds, loose stone check dam, gully plugging) completed or nearing completion.
Degradation of vegetative, forest cover	To assist individual farmers to improve water availability for agriculture	SMC measures on individual farms (boulder bund, earthen bunds, and stone outlets).
Shrinking pasturelands and fewer livestock	To increase biomass and surface and ground water availability	Planting of tree and fodder species in watershed and pastureland areas respectively
Increased climate variability	To strengthen inter-linkages between different production systems and enhance market linkages	Demonstration plots, exposure visits, training on sustainable agriculture for soybean and wheat.
Excessive run-off and soil poor retention capacity		
Livelihood and credit issues		
Dependent on agriculture, wage labour, seasonal migration, and forest resources for income		
Chronic debt and high dependence on moneylenders		Distribution of horticultural trees, livestock breed improvement
Institutional issues		
Weak and poor representation of tribals in local fora like Panchayati Raj Institutions (PRI) and in public spheres like government	To assist communities in regulating biomass and water demand through locally developed rules and norms. Capacity building for planning, implementing government schemes	Formed Village Watershed Committee (VWC) and provided training.
Lack of strong leadership		Decentralised planning for SMC activities
Erosion of traditional resource management systems		

strengthened by the implementing NGO with a mandate of forest protection and management.

- Women Self Help Groups (SHG) within villages created by the implementing NGO to encourage savings and credit activity, promote livelihood generation, and achieve ancillary aims of women empowerment.

3. Methodology

The paper draws on primary and secondary data to make its arguments. For primary data, a multi-method strategy using qualitative and quantitative tools was used to collect a multi-scale dataset and triangulate findings. Benefits of the watershed project were evaluated at the watershed level (among hamlets), hamlet-level (between households) and within households. Data were collected over ten months of fieldwork (October 2011–July 2012) through six focus group discussions (typically with 3–4 farmers), household-level semi-structured questionnaires ($n = 133$), key informant interviews ($n = 36$), participant observation, and document reviews. Within the watershed, all households were surveyed to represent all possible farmer types based on demography, location, asset ownership, and social capital. Key informants included progressive farmers, shopkeepers in neighbouring towns, government officials, and NGO workers, all of whom helped construct a wider picture of beyond village-level issues. Policy documents were analysed to understand how watershed development envisaged building local adaptive capacity to climate change and water scarcity. Details of the research methodology and questions asked are described in [Singh et al. \(2016\)](#).

4. Results

This section examines the WDP along four ‘outcomes’ of the project: (1) NRM benefits, (2) income generation and livelihood diversification benefits, (3) coping and adaptation benefits, and (4) institutional and capacity building benefits. Project interventions were evaluated based on principles of efficiency, equity, and sustainability, which the watershed guidelines ([GoI, 2008](#)) identify as necessary for successful implementation.

4.1. Ecosystem components: natural resource restoration and management

The project undertook soil moisture conservation (SMC) measures in the watershed area and on individual farms through construction of contour trenches, stone and earthen contour bunds, and stone check dams. These arrested top soil erosion with 138 m³ of soil deposited on common land bunds and 1855 m³ soil deposited on private farmland bunds ([FES, 2011](#)). The VWC President corroborated the findings,

For me, the biggest surprise was the amount of silt deposited on farm bunds. No one had realised how much top soil was washed away by the rains. Several farmers voluntarily made bunds on their farms after seeing the benefits. [KI_Farm_10]²

The second indicator of improved moisture availability was the increased acreage of winter crops ([FES, 2011](#)). The positive impacts of building water storage structures such as check dams along seasonal streams resonated in farmer experiences,

Rajnath and his family of five have half an acre (0.2 ha) land near a check dam built in 2007. Until 2007, he grew maize and black lentils in the rainy season and left his land fallow in winter. After construction of the check dam, he began growing wheat in winter, which helped feed his family for an additional four months. Although water was available in the stream before the check dam, he could only get 2–3 irrigations. Now he waters his wheat 5 times/season and has invested in pipes and a second-hand engine to pump water. The check dam ensured an assured supply of water, increased yield (from 280 to 330 kg/hectare), and reduced drudgery. Rajnath explained: “Earlier I spent two days for irrigating because I had to buy water from another person’s well. I had to pay for two days of diesel. Now I can irrigate my land in one day.” The check dam also provided drinking water for livestock and labour opportunities during construction. [Field notes from household interview]

SMC activities provided temporary employment, which was highly sought because it was within the village and had timely and transparent payment process.³ There was less evidence to suggest longer-term watershed benefits such as groundwater recharge, improved mechanisms to use and share water during limited periods, or adaptive resource management. Moreover, increased water availability accrued through SMC interventions was often negated by a concurrent rise in the cultivation of water-intensive crops such as garlic, and this focus on improving water supply without managing demand undermined the WDP’s outcomes.

The project also included afforestation interventions, where tree saplings of ecologically compatible species were planted on 4886 ha of common lands. In 2010–2011, 1000 bamboo saplings were planted along stream banks to arrest soil erosion and provide poles for house construction. While the bamboo planting drive was very successful, afforestation interventions were relatively less successful. Two quotes illustrate this,

² Note on coding of references: The first letters denote kind of actor (HH = Household, KI = key informant, GOV = government official, NGO = civil society worker). The numbers denote household number, and last letters denote name of hamlet. Thus, HH_55_CP refers to the 55th household interviewed, from Hamlet Chhota Pathar. Similarly, KI_NGO_3 refers to a key informant from an NGO, who is numbered 3.

³ I witnessed many instances of payments. They were always in common places like the *Panchayat* Room. Farmers confirmed that payments were transparent and regular unlike the government’s employment generations scheme where farmers reported wrong payments and long delays. In credit-constrained rural areas like Pratapgarh, where farmers need money to buy agricultural inputs and repay debts, prompt payments are particularly crucial.

People need fuel and timber for their homes. With increasing population, there is greater pressure on forests, and people cut immature trees. The tree planting initiative was good, but you cannot tell people to stop cooking and so tree felling (for fuelwood) continued as before. VFPMC Member

Bamboo planting was very useful. Since it was planted along streams, extra land was not needed. In fact, I thought it would be a good investment for the future and got extra cuttings to plant along my farm. VWC Member

The first quote reflects that although afforestation interventions were welcome, they were not sustainable because no alternatives were provided for a population heavily dependent on forests for fuel wood, fodder, and timber. The lack of robust institutions to protect and manage the newly planted trees meant that felling continued unchecked. The second quote indicates that ecologically appropriate and economically sound interventions were adopted enthusiastically.

To ensure fodder security and discourage overgrazing, livestock-appropriate local grass species were planted on 15 ha of common land. The fodder was distributed based on the number of livestock per household. While the interventions increased fodder availability by 36% (FES, 2011), poor functioning of the VWC with unclear role demarcation meant that two years after being set up, the pasturelands had become free-for-all. This inability to manage the pastureland collectively reinforces the need for ecological restoration efforts to be integrated with institution building.

Inter-household spatial inequities were also observed: geographically isolated hamlets on the plateau had low membership in SHGs and were thus excluded from consultative and participatory processes (Fig. 2). This was crucial because these communities were more water scarce, poorly connected to markets, and had fewer livelihood opportunities than other hamlets. Of the respondents who perceived the WDP as beneficial, 30% ($n = 18$) were from respondents from the valley because three check dams were built there. Hamlets near the road benefited partially because they used water stored by the check dams for their livestock. Despite being within the watershed area, hamlets on the plateau did not perceive benefits from increased water availability.

4.2. Livelihood components: income generation and livelihood diversification

Employment generated by the project aimed to reduce seasonal migration and supplement household income (FES, 2011). However, the qualitative data did not support this entirely. When shown data on decreasing trends of seasonal migration, the ex-village head reported,

Wages provided during the project were very good and helped increase household income, but people who migrate every year continue to migrate. Watershed work is for limited time and so cannot bring families out of indebtedness.

An independent study in the neighbouring watershed found that migration, especially among youngsters, had increased in the area, because of better connectivity and exposure to the external world (Raj and Pasupati, 2012). Thus, reduction in seasonal migration because of the WDP had unclear trends.

Livelihood generation activities focussed on landless households and women (FES, 2006) and included widows setting up village-level grocery shops, training women to form micro-credit groups, introducing sturdy livestock breeds for additional income, and promoting organic horticulture.

For example, multi-purpose horticultural tree species of different varieties⁴ were distributed to increase fodder and fuel wood access, and generate supplementary income. Around 85% of these plants had reportedly survived after three years of the project (FES, 2011). However, farmers reported high mortality in saplings due to water scarcity, especially in summer. A respondent who did not own a well mentioned,

I tried watering the plants, but in summer, tankers supply water to the village, and we have to walk 2 km to get it. We could only carry water sufficient for drinking and cooking. So, the saplings died. [HH_KP_31]

Apart from insufficient water, distribution of only five trees per household (some beneficiaries reported receiving 1–2 trees) meant that the intended benefit of supplementing incomes was unmet. Evidence from a neighbouring watershed provided good practices for successful horticultural orchards. The reasons for this success were having adequate resources (large landholding, two wells), necessary experience (which led to regularly watering of saplings and fencing them against animals), and social capital (contacts with the Forest Department for technical advice). Without adequate natural and financial assets, strong linkages for technical inputs, and a clear understanding of possible financial benefits, it is overambitious and simplistic to expect that resource-constrained, poorly connected households will supplement incomes through the distribution of a few tree saplings.

Although the project specifically targeted poor and marginalised households (FES, 2006), the connection between planned and actual identification of wage labour beneficiaries was unclear, generating spatial inequities in who benefitted from wage labour. For example, 95% households in the valley worked as temporary labour against 12% households on the plateau. Thus, farmers on the plateau, whose livelihood opportunities were already restricted by poor transportation and lack of road connectivity, were further disadvantaged.

⁴ Karonda (*Carissa carandas*), Mahua (*Madhuca longifolia*), Karanj (*Milletia pinnata*), Desi babool (*Acacia nilotica*), Jackfruit (*Artocarpus heterophyllus*), Mango (*Mangifera indica*), Lemon (*Citrus limon*), Guava (*Psidium guajava*).

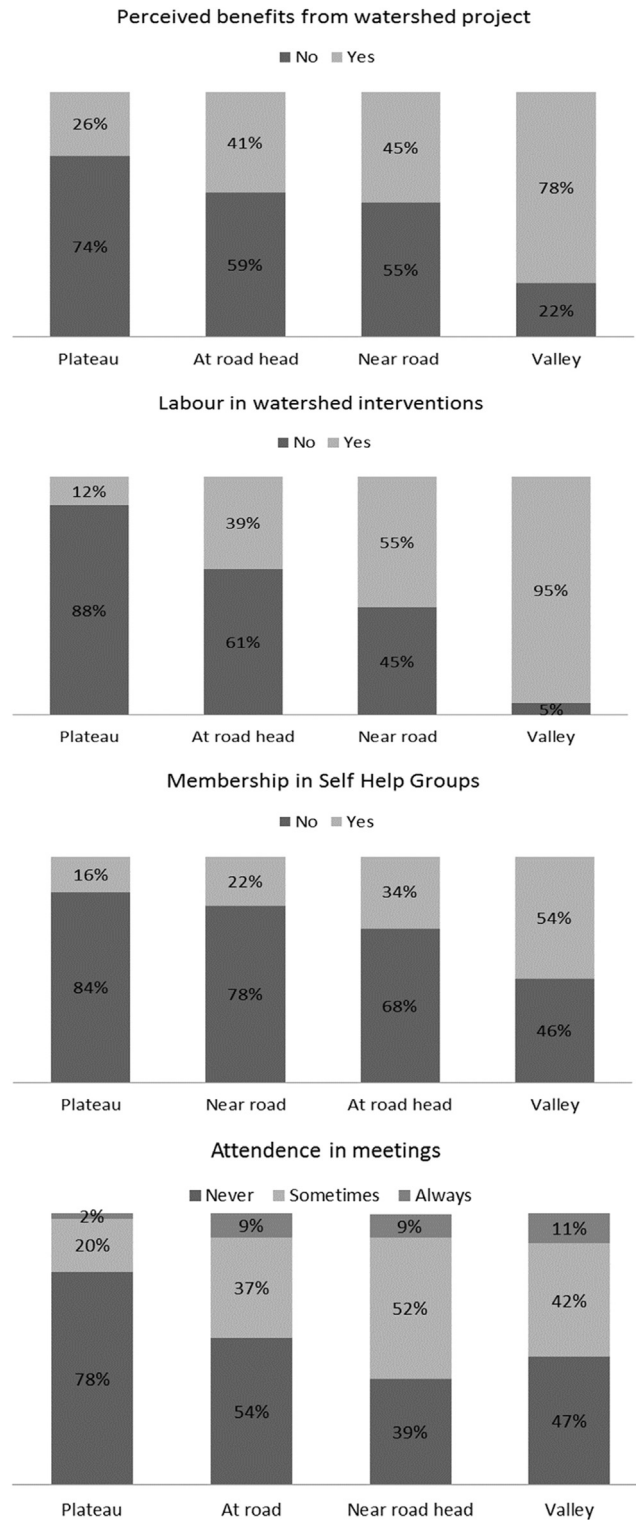


Fig. 2. Spatial inequities in infrastructural and capacity building interventions. Source: Household survey

4.3. Local coping and adaptation strategies

To understand local risk management strategies, questions on responses to climate change and water scarcity, as well as associated livelihood-enhancing, income-diversifying and food-securing strategies, were sought using an open-ended exploratory

Table 5
Household response strategies to climate variability and water scarcity (N = 133)^a.

Coping strategies		% responses
No response		7(9)
Change in agricultural practices	Leave land fallow in one season	45 (61)
	Second sowing	33 (44)
	Sharecropping	4 (5)
Shift towards food security	Store seed at home	45 (60)
	Store food	31 (42)
Reliance on social safety nets	Government welfare schemes ^b	39 (52)
	Distribute responsibilities (children/livestock) among relatives	4 (5)
	Source food from relatives	2 (3)
Temporary credit access and income maintaining strategies	Buy food from market	89 (119)
	Daily wage labour	85 (114)
	Petty trading	67 (90)
	Decrease food intake	43 (58)
	Government aid ^c	43 (57)
	Pawn jewellery	34 (46)
	Sell few livestock	25 (34)
	One-time seasonal migration	20 (27)
	Loan from relatives	12 (16)
	Stop education	25 (34)
Erosion of human capital		
Adaptive strategies		
Change in agricultural practices	Crop diversification	49 (65)
	Altering sowing time	43 (57)
	Growing more food crops	21 (28)
Water management practices	Grow less water requiring crops	13 (18)
	Soil/water management work	13 (18)
	Improved irrigation method (sprinkler irrigation)	1 (1)
Change in livelihood	Regular seasonal migration	21 (28)
Credit access	Loan from bank and crop insurance	26 (35)

^a Households perform more than one type of response strategy. Numbers in brackets denote number of respondents who indicated a particular strategy.

^b For example Food for Work Programme.

^c Aid in terms of money (drought relief).

methodology similar to Thomas et al. (2007). Data were collected during the monsoon (*khari*) and winter (*rabi*) agricultural seasons.

People used various response strategies (Table 5) either singly or in tandem, and these were differentiated by timing of use (certain strategies carried out at certain points in the agricultural cycle) and duration of strategy (short-term coping to long-term adapting). Overall, during normal variability, households responded by changing cultivation practices and farm and livestock-related activities. In periods of severe stress (either climatic such as drought or non-climatic such as death in the family), households diversified into non-farm activities like wage labour and short-term migration.

Household coping strategies were either positive (selling a few livestock to access credit) or negative (selling all livestock to overcome shock). They revolved around ensuring food security by small purchases in local markets (often in exchange for stored soybean), supplementing income through temporary wage labour, and leaving land fallow in winter in response to insufficient water.

The most common adaptive strategy was adjusting agricultural practices through crop diversification (48% respondents) or altering sowing times (44%). Although adaptive actions were largely individual efforts driven by farmer resourcefulness and social capital, 18% households reported investing in long-term adaptive strategies related to soil and water management that were enabled by the WDP. The WDP also facilitated adaptation indirectly, such as by encouraging crop diversification by augmenting water availability in winter.

4.4. Processes of participation: institutions and capacity building

To understand the processes and implications of participation in Pratapgarh, community-based groups (VWC, VFPMC, and SHG) were examined for equitable representation and institutional sustainability. Here, SHGs are discussed to illustrate issues across the groups and highlight how interventions to build generic capacity fell short.

All three SHGs underwent exposure visits and training on handling finances. Two groups were completely dysfunctional (no regular meetings or collections), and the third met occasionally but did not conduct credit and savings activities. To understand why these SHGs had become dysfunctional within 3–4 years of their inception, two groups, one part of the watershed project (which had become dysfunctional) and the other, a government initiative (functional for five years), were compared. The government-formed group had strong leadership. The group's president was young (35 years), educated up to high school, had networks within the village because she was the local midwife and had undergone trainings and exposure visits related to running SHGs and livelihood diversification. Contrastingly, the dysfunctional group's president was much younger (26 years old) and barely literate, undermining her power within the group. She had gone for three exposure visits on using smokeless cooking stoves and forest management, which did not equip her with the skills to lead an SHG. This, and other data suggested that successful groups were characterised by small

group size with relatively homogenous membership, frequent meetings (which was easier when members lived close), an educated president with strong leadership skills, and regular training for all group members with processes of within-group learning.

Pointing out the true role of SHGs, a government official noted,

It is not enough to make SHGs on paper. Keeping the group as a loaning and borrowing institution alone is not worthwhile or sustainable. Groups must be linked to banks and empowered enough to earn. If made well, SHGs can be instrumental in making women financially secure. [KI_GOV_10]

Since SHGs can potentially go beyond financial empowerment towards increasing women's agency within the village and household, as well as becoming truly involved in NRM activities (Seeley et al., 2000), there is a need for strengthening existing SHGs and linking them to well-suited livelihood generation activities. Such an expanded vision of SHGs could build generic capacity through increased agency and higher capital to invest in household strategies.

Spatial inequities were also seen in the institution-forming and capacity-building initiatives. For example, on SHG membership, one respondent from the plateau said,

Such things (SHGs) do not run in our village. I have heard of such groups in neighbouring hamlets, and they seem to help collect money. But no one calls us to join them. We do not even know how to approach anyone for this. HH_5_CP

Thus, even those who recognised benefits of group membership were unable to join them because they perceived themselves as incapable of joining or making groups. Groups were made where village leaders showed initiative, which meant that people without the power to self-organise or agency to ask for help, had been excluded. The quote also demonstrates a lack of empowerment, where group formation is perceived as something an external agency 'does'. Thus, within the same watershed, inadequate information about groups, mistrust regarding external agents, and perceptions of isolation were observed. Attendance in NGO-led training programmes and local governance meetings were also significantly differentiated by location, implying that isolated asset-constrained households were less involved in capacity-building initiatives, thus reinforcing existing gaps in generic capacity. Such uneven participation, shaped by geographical and social differences, undermined potential benefits of the WDP by reinforcing existing divisions and marginalisation.

5. Discussion

Multiple manifestations of participation were observed. I diagnose these manifestations by examining (1) who participated and how, (2) how sustainable these processes are, (3) the role of the larger institutional regime in mediating participation, and (4) implications of the above for local adaptation. In doing so, I highlight how participatory watershed development, as currently implemented, fails to meet its full potential of building generic and specific adaptive capacity.

5.1. Multiple manifestations of participation

Participation was limited to beneficiaries participating before and during the project. Although time was spent on social organisation, beneficiaries did not necessarily associate themselves as members of the community institutions. This was because group composition, roles, and membership were led by the implementing agency. Participatory identification of intervention and demonstration sites were positive steps. However, their impact on the larger community beyond the NGO-trained local representatives was limited. Although all labour generation and capacity-building interventions actively sought and secured female participation, this was mostly obligatory and did little to influence their livelihoods or agency. Below are two commonly encountered narratives from female respondents:

Yes, I attended meetings when the project first came to our village. I did not understand what they said. The village head said it is good for us, so we agreed. [HH_NA_113]

We are illiterate. They showed us charts about check dams, but I could not understand them. I feel shy to speak in a meeting where my father-in law is present. [HH_HK_7]

The quotes highlight that social and cognitive barriers constrained women from engaging in participatory processes. Social barriers included being embedded in a patriarchal society with rigid gendered roles, which included women being restricted from speaking in public and participating in local governance. Cognitive barriers included feelings of inferiority, fear, and weakness arising from perceived lower status than that of men, notions regarding women's opinions being limited to domestic issues, and restricted access to information. Such socio-cognitive barriers play a significant role in perceived adaptive capacity, i.e. a person's perceptions of his/her own ability to adapt (Singh et al., 2016). Although meaningful participation could address such barriers, the present tools to include women (such as SHGs) failed to do so.

These findings build upon previous reflections that WDPs vary in degrees of participation and translation of ideals into action (GoI, 1994; Kerr et al., 2000; Kerr, 2001; Kolavalli and Kerr, 2002; GoI, 2006). I found that where capacity-building elements were present, they were short-term, and did not address socially embedded inequities. In some cases, they replicated inequities based on gender and caste, which has been a key critique of participatory NRM (Agarwal, 2001).

The lack of attention to the role social differentiation plays in effective participation is also found in the Common Guidelines for Watershed Development (GoI, 2008) in which the 'community' is conceptualised as a village where people share a common history

and ethnicity, low internal factions, have homogenous landholdings, and are willing to work for common goals (Chhotray, 2004; Sangameswaran, 2008). Such an apolitical and ahistoric reading of villages dismisses the role played by historical trajectories of marginalisation, socio-economic inequities, and multiple and often conflicting aspirations in people's responses to climatic and non-climatic risks.

5.2. *Issues of sustainability*

Field observations strongly indicated that physical structures built under the WDP would be maintained after the project ended because of the tangible benefits to individuals. Since individuals give more weightage to short-term private gains as compared to long-term social gain (Joshi et al., 2008), this translated into farmers maintaining the structures to ensure continued water availability, especially in the winter. Unfortunately, there was little evidence to suggest that institutions developed through the project would remain functional beyond it.

This is because of four reasons. First, the watershed committees comprised all the beneficiaries in the watershed area, ensuring equity but diluting responsibility. Second, even during the project, members were unclear about their role and group aims. Third, the project was perceived as belonging to the implementing agencies. This perceived lack of ownership transferred decision-making responsibilities to external actors. Finally, inadequate market linkages for livelihood generation interventions resulted in low community acceptance. Overall, the findings add to concerns about the future of WDPs once implementing agencies exit (Kolavalli and Kerr, 2002; Wani et al., 2008). This project cycle-based approach suggests that once adaptive capacity is 'built', adaptation is meant to 'follow' and be 'done', which is contrary to the growing acceptance that adaptation requires iterative learning, flexibility, and deep behavioural change far beyond project lifespans.

A broader sustainability concern is the continued focus on increasing water supply (for example, storing water for winter crops) without attempting behavioural changes towards decreased demand (such as growing less water-intensive crops). Such approaches almost rationalise unsustainable agricultural intensification (Bharucha et al., 2014); disincentivise demand reduction; and promote an agricultural pathway that is irrigated, favours cash-crops, and is resource-intensive (Daftary, 2014). This has critical implications for resource stewardship and local adaptation.

5.3. *The institutional landscape as a mediator of participation*

The implementing agency's long association in the region had built mutual trust, facilitated cooperation, and enhanced implementation and acceptance of the WDP. However, while the project met infrastructural targets and participation was not "reduced to mere empty procedures" (Chhotray, 2004:329), it fell short on capacity-building targets such as women's empowerment and livelihood diversification. Government-led agriculture extension and public welfare schemes in the region also reported a lower impact than intended (TERI, 2010), making this author postulate that non-project factors like corruption and token participation affected project outcomes. Although corruption and token participation are often intangible, they play an important role in mediating the implementation and outcomes of participatory WDPs.

5.3.1. *Macro-scale infrastructure and institutional failures*

In the absence of supporting infrastructure, agricultural benefits from watershed interventions are potentially undermined at pre-sowing (inadequate seed availability), in-season (poor irrigation infrastructure and erratic/no electricity), and post-harvest (poor market linkages, roads and transportation) stages. Recognising this, researchers have argued for a 'watershed plus' approach (Kerr 2002:79), which attempts to broaden socio-economic benefits from watershed development (e.g. improved agricultural returns) to include livelihood diversification, improved access to drinking water, and community empowerment (Hope, 2007). As the case of Pratapgarh shows, unless WDPs are embedded in an institutional environment that fosters local agricultural innovation, building adaptive capacity will be difficult. In addition, current watershed projects must be meaningfully integrated with other rural development projects to fully unlock the capacity-building potential of WDPs.

5.3.2. *Community empowerment remains crucial*

Tribal communities, such as those in Pratapgarh, have a history of socio-economic and political marginalisation. Empowerment can impart confidence, erode perceptions of inferiority and self-inefficacy, and build local capabilities. Meaningful empowerment can also diffuse current polarisations of the State as 'provider' and community as 'receiver', where smallholder farmers are 'beneficiaries' of external interventions. This narrative of victimisation obscures the farmer's role as a producer and an active decision maker who, operating within the context of risk and uncertainty, makes agricultural decisions and livelihood choices. Given the socio-cognitive constraints to adaptation farmers reported, (see Section 5.1 and Singh et al., 2016), inadequate empowerment remains a critical barrier to adaptation in Pratapgarh.

5.3.3. *Corruption and disengaged development across government institutions*

While the WDP functioned in a transparent manner, farmers repeatedly reported corruption in government-implemented schemes (Table 6). These reports, corroborated by NGO workers and acknowledged by government officials, affected farmer livelihoods and undermined implementation of development programmes and their adaptation co-benefits.

One key informant explained entrenched corruption through an example of income-based subsidies,

Table 6

Farmer quotes illustrating the entrenched and cross-scale nature of corruption.

Source: Household interviews

Characteristic	Illustrative key informant quote
Gap between intended and actual deliverables with subsidies being siphoned by powerful actors.	Only 20% subsidised fertiliser, pesticide, and seed comes to the Panchayat due to hoarding by private dealers and government officials. [HH_K_108]
Actual and perceived corruption, lack of transparency led to a loss of faith in government	All the schemes are reduced to names on a piece of paper. The State promises big things but only 20% of the benefits trickle down to 10% of the people. [HH_J_121]
Institutionalisation of corruption and bribery	We cannot talk to bank officials directly. We have to go through <i>babus</i> (clerks) who take bribes. With each file, you have to pay a bribe, so if the interest rate is 7%, you end up paying 14%. [HH_NA_9]

The amount of subsidised seed or fertilizer reaching a poor family depends on their relationship with the village representative. This representative must have a voice in the *Gram Sabha* (village forum), which must then be further presented in the *Panchayat Samiti* (local governance unit). One must pray that as the money moves from the Centre to State to District to Block to Panchayat to village, enough of it trickles down without being diverted into ‘other’ channels. Simultaneously, as the list of needy families moves up, you must hope that your name makes it all the way. Frankly, it is less your actual depravity and more your ‘networks’, your ability to milk your ‘contacts’, and your resourcefulness to oil the system that gets you the ‘free’ seed and fertilizer or pension that is rightfully yours. [KI_NGO_6]

Another issue that emerged was disengaged agents of development where development officers spoke of tribals being lazy and retrogressive in a manner that was at odds with their mandate of working towards tribal empowerment. Quotes from two district officials in the agriculture and rural development respectively are illustrative,

I come here (Pratapgarh) for two days a week. You are very lucky to have found me today ... Tribals do not think about the future. They are more interested in buying mobiles and motorcycles for immediate satisfaction. That is why they cannot develop. [KI_GOV_2]

Why have you come to Pratapgarh? This place is terrible. These *Meenas* (tribals) are lazy. Why should they get all this money from the government? [KI_GOV_7]

The quotes indicate an ideological disengagement from tribal development issues, potentially leading to perfunctory project implementation and detachment from outcomes. Overall, farmers reported disillusionment with the State as an agent of development. Contrarily, government key informants implied that being a ‘tribal belt’ Pratapgarh was bound to lag on development indices. While government actors face political pressure to meet budgetary allocations and have limited human resource capabilities (Clement and Chandrappagari, 2014), unless cognitive biases are not acknowledged and addressed, the aims of effective community participation will remain poorly implemented.

Despite a sustained discourse of corruption in South Asia and its implications for public welfare schemes (Robbins, 2000), watershed development assessments cursorily mention the role of corruption in eroding project benefits (Rajesh, 2000; Robbins, 2000; Chhotray, 2007; Fritzen, 2007). Thus, unless macro-scale, non-project issues like corruption and inadequate community empowerment are addressed, participation will be restricted to community enlistment, which undermines longer-term behavioural shifts required for adaptation.

5.4. Implications for local adaptive capacity

The WDP in Pratapgarh had three explicit aims: ecological restoration, livelihood strengthening and income generation, and community empowerment through institution building. These aims are arguably critical in building local capacity to deal with existing and future climate variations. Overall, infrastructural approaches such as check dams to improve rainwater percolation were implemented well. These helped restore natural resources and meet soil and moisture conservation goals (Section 4.1). However, changes in peoples’ behaviour (e.g. soft approaches such as promoting water saving through using drip irrigation and empowering women through training self-help groups) were inadequately planned for, invested in, and implemented. This, I argue, has implications for the entire social-ecological system since hard and soft adaptation approaches are associated with different costs: hard responses, which are typically irreversible, tend to lock-in systems and cut off future adaptation options; soft options if done optimally, have longer-term outcomes that can enable adaptation (Hallegatte, 2009). Furthermore, infrastructural interventions do not lend themselves to revision, which is crucial for flexible, forward-facing resource management (Clement and Chandrappagari, 2014), especially in the context of dynamic risks such as climate change.

When examined through an adaptation lens, WDP interventions can be assessed to find entry points (Table 7) to make them more efficient, equitable, and sustainable. Entering with a ‘supply-oriented mindset’ (Bharucha et al., 2014:1210), the WDP inadvertently allowed and in some cases, facilitated unsustainable practices. For example, farmers continued to dig wells and extract groundwater for irrigation, despite Pratapgarh’s groundwater being categorised as overexploited (CGWB, 2007). Increased water availability meant a shift towards water-intensive crops such as garlic as opposed to traditionally grown black gram. At worst, the introduction of non-indigenous crops such as soybean, could be maladaptive in the long run because it fosters reliance on private seed dealers and

Table 7
Interpreting watershed development interventions through an adaptation lens.
Source: Author analysis

<i>WDP outcome</i>	<i>Intervention</i>	<i>Hard or soft intervention</i>	<i>Builds generic or specific adaptive capacity</i>	<i>Entry point to strengthen interventions towards positive adaptation outcomes</i>
Natural resource restoration and management	Soil moisture conservation (SMC) measures (contour trenches, contour bunds, check dams).	Hard	Generic capacity (decreased soil erosion, increased crop output) Potentially specific adaptive capacity through increased water availability during dry spells Generic capacity (decreased soil erosion)	<p>Focus on facilitating behavioural changes such as managing water demand instead of augmenting supply which can lead to concurrent rise in cultivation of water-intensive crops</p> <p>Bedrock of generic adaptive capacity (e.g. ensuring water availability) can support ancillary activities (e.g. afforestation) Institution building is a prerequisite for resource stewardship: Common grasslands were exploited after few years because of poorly functioning Village Watershed Committee with unclear sharing norms Income generating activities need to be contextual and demand-driven to be sustainable beyond the project. Linking livestock provision with other services such as veterinary assistance, breeding advice can augment impacts. Co-development of institution aims and norms as a process, not one-time activity to create sustainable and inclusive institutions. Stronger focus on capacity building and linking groups with income generating activities is essential. Changing monitoring processes with focus on co-learning critical.</p>
	Afforestation	Hard		
	Growing local grass species on common lands	Hard, Soft	Generic capacity (increased fodder availability) Potentially specific adaptive capacity through livestock which act as buffers during lean periods	
Income generation and livelihood diversification	Setting up village-level grocery shops	Hard	Generic capacity (supplementary income)	<p>Linking livestock provision with other services such as veterinary assistance, breeding advice can augment impacts.</p> <p>Co-development of institution aims and norms as a process, not one-time activity to create sustainable and inclusive institutions.</p> <p>Stronger focus on capacity building and linking groups with income generating activities is essential. Changing monitoring processes with focus on co-learning critical.</p>
	Introducing sturdy livestock breeds for additional income	Hard	Generic capacity (supplementing income) Specific adaptive capacity (climate resilient livestock buffer during drought)	
Institutional and capacity building	Formation of multiple local institutions	Soft	Generic capacity (improved resource management, community empowerment)	<p>Co-development of institution aims and norms as a process, not one-time activity to create sustainable and inclusive institutions.</p> <p>Stronger focus on capacity building and linking groups with income generating activities is essential. Changing monitoring processes with focus on co-learning critical.</p>
	Capacity building of women's self-help groups	Soft	Generic capacity (savings and credit, empowerment)	

necessitates trade-offs with food crops.

Gains from capacity-building interventions aimed at strengthening social capital and diversifying livelihoods were uneven across hamlets (Section 4.2). Thus, the WDP was lopsidedly achieving hard adaptation goals without a similar focus on ensuring inclusiveness and participation. Given the growing recognition that changing behavioural norms is crucial to initiate and sustain long-term adaptation (Hallegatte, 2009; Jones, 2012), this gap is crucial.

The WDP in Pratapgarh is presented as an illustrative case to reflect on lessons from past interventions to inform future programmes. Expanding these findings to other similar interventions, it is argued that the potential of WDPs to build local adaptive capacity is being undermined by a focus on relatively low-hanging fruit such as soil and water conservation activities without adequate engagement with the processes and politics that undermine the efficacy and sustainability of these interventions. In the long-run, this means that investments in WDPs that do not account for and invest in socially embedded issues—participation, social differentiation, and corruption—will not build local adaptive capacity to deal with climatic and non-climatic risks.

6. Conclusion

Over its history, watershed development policy in India has seen recommendations advocating community participation (GoI, 1994; GoI, 2006; GoI, 2008; GoI, 2011). More recently, watershed development is presented as a means to build local adaptive capacity, especially in the context of increasing climate variability and change (Gray and Srinidhi, 2013; Chaudhari and Mishra, 2016).

Using an illustrative example from Rajasthan, India, this paper examined whether participatory watershed development as it is currently implemented, can contribute to local climate change adaptation or not. Exploring outcomes of watershed development through natural resource regeneration, livelihood generation, and institution building, I found that hard adaptation strategies such as building infrastructure for soil and moisture conservation were well implemented. However, softer approaches to adaptation such as building local capacity to negotiate existing power dynamics or enabling behavioural changes towards sustainable water management were not being planned for, let alone met. Such omissions have serious implications for the role of WDPs in building local adaptive capacity and long-term sustainability.

As a way forward, the metrics on which WDPs are currently evaluated (number of check dams built, number of SHGs formed, crop loss averted) need to be expanded to include indicators that ensure beyond-project, wider social-ecological sustainability, and incentivise adaptive capacity through behavioural change. More importantly, it is imperative to recognise that WDPs operate within a larger institutional landscape where shifts towards individualised farm-level NRM (Daftary, 2014) and increasing water supply instead of reducing demand (Bharucha et al., 2014) undermine adaptive capacity built through WDPs. This focus on increasing supply without a concurrent emphasis on managing demand erodes the gains made by watershed interventions and incentivises an environment of extraction and agricultural intensification.

Four crucial points emerge

- Structural interventions increased water and fodder availability (thus building generic capacity). However, without a similar emphasis on building robust institutions to manage and take ownership of these structures, an opportunity to encourage local adaptation through behavioural changes was missed;
- In practice, non-inclusive participation raises equity concerns among communities that are heterogeneous and differentially vulnerable. This has implications for whose capacity is enhanced and whether the most vulnerable (typically, tribal farmers who own farms on slopes and with poor soils) benefit from WDP interventions;
- Non-project factors like corruption, lack of community empowerment, and inadequate attention to post-project sustainability undermine project outcomes, and thus undermine the potential of WDPs to build long-term adaptive capacity and encourage transformative change.

The benefits of WDPs are higher where people's participation is higher (Joshi et al., 2008). However, participation does not necessarily ensure the facilitation of adaptation processes, which usually require changing behavioural norms and sustainability beyond project timeframes.

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References

- Agarwal, B., 2001. Participatory exclusions, community forestry, and gender: an analysis for South Asia and a conceptual framework. *World Dev.* 29 (10), 1623–1648.
- Agrawal, A., Gibson, C.C., 1999. Enchantment and disenchantment: the role of community in natural resource conservation. *World Dev.* 27 (4), 629–649.
- Ajai, Arya, A.S., Dhinwa, P.S., Pathan, S.K., Raj, K.G., 2009. Desertification/land degradation status mapping of India. *Curr. Sci.* 97, 1478.

- Arnstein, S.R., 1969. A ladder of citizen participation. *J. Am. Plan.* 35 (4), 216–224 (July 1969).
- Bharucha, Z.P., Smith, D., Pretty, J., 2014. All paths lead to rain: explaining why watershed development in India does not alleviate the experience of water scarcity. *J. Dev. Stud.* 50 (9), 1209–1225.
- Bokil, M., 2000. Drought in Rajasthan: in search of a perspective. *Econ. Political Wkly.* 35, 4171–4175.
- Boyd, E., 2017. Climate adaptation: holistic thinking beyond technology. *Nat. Clim. Change* 7, 97–98. <http://dx.doi.org/10.1038/nclimate3211>.
- CGWB (Central Groundwater Board), 2007. Groundwater Scenario: Chittaurgarh District, Rajasthan. Ministry of Water Resources, Government of India, Jaipur, India. http://www.cgwb.gov.in/District_Profile/Rajasthan/Chittorgarh.pdf Last (accessed 12 February 2017).
- Clement, F., Chandrappagari, S., 2014. Translating watershed guidelines on the ground. *Econ. Political Wkly.* 49 (13), 53–60.
- Chaudhari, V.R., Mishra, A., 2016. Multilevel policy responses to mainstream climate adaptation through watershed development in rainfed farming systems of India. *Clim. Dev.* 8 (4), 324–335.
- Chhotray, V., 2004. The negation of politics in participatory development projects, Kurnool, Andhra Pradesh. *Dev. Change* 35 (2), 327–352.
- Chhotray, V., 2007. The ‘anti-politics machine’ in India: depoliticisation through local institution building for participatory watershed development. *J. Dev. Stud.* 43 (6), 1037–1056.
- Cooke, B., Kothari, U., 2001. *Participation: the new tyranny?* Zed Books, New York.
- Cornwall, A., 2003. Whose voices? Whose choices? Reflections on gender and participatory development. *World Dev.* 31 (8), 1325–1342.
- Currie-Alder, B., 2007. Unpacking Participatory NRM Distinguishing Resource Capture from Democratic Governance. In: Warner, J. (Ed.), *Multi-stakeholder platforms for integrated water management*. Ashgate, Hampshire, England, pp. 245–258.
- Daftary, D., 2014. Watershed development and neoliberalism in India’s drylands. *J. Int. Dev.* 26 (7), 999–1010.
- Eakin, H.C., Lemos, M.C., Nelson, D.R., 2014. Differentiating capacities as a means to sustainable climate change adaptation. *Glob. Environ. Chang.* 27, 1–8. <http://dx.doi.org/10.1016/j.gloenvcha.2014.04.013>.
- Escobar, A., 2011. *Encountering Development: the making and unmaking of the Third World*. Princeton University Press, New Jersey, USA.
- FES (Foundation for Ecological Security), 2006. NABARD ITC Indo-German Watershed Development Programme (Kherot 3 Watershed). Project Proposal submitted to NABARD, Udaipur. Foundation for Ecological Security, Udaipur, Rajasthan, India.
- FES (Foundation for Ecological Security), 2011. NABARD ITC Indo-German Watershed Development Programme (Kherot 3 Watershed): Impact Evaluation Report. Foundation for Ecological Security, Pratapgarh, Rajasthan, India.
- Fritzen, S.A., 2007. Can the design of community-driven development reduce the risk of elite capture? Evidence from Indonesia. *World Dev.* 35, 1359–1375.
- Gol (Government of India), 1994. Hanumanth Rao Technical Committee on Drought Prone Areas Programme and Desert Development Programme. Ministry of Rural Development, New Delhi, India. <http://dolr.nic.in/dolr/TechCommitteeReport1994.asp> (Last accessed on 18 February 2017).
- Gol (Government of India), 2006. Parthasarathy Committee Report “Hariyali to Neeranchal. Report of the Technical Committee on Watershed Programs in India. Department of Land Resources, Ministry of Rural Development, New Delhi, India. <http://dolr.nic.in/dolr/ParthaCommitteeReport.asp> (Last accessed on 18 February 2017).
- Gol (Government of India), 2008. Common Guidelines for Watershed Development Projects. National Rainfed Area Authority, Planning Commission, Government of India, New Delhi, India (Last accessed on 15 February 2017).
- Gol (Government of India), 2011. Common Guidelines for Watershed Development Projects—2008. Revised Edition 2011. National Rainfed Area Authority, Planning Commission. Government of India, New Delhi, India. <http://dolr.nic.in/dolr/downloads/pdfs/Common%20Guidelines%20for%20WDP%202008%20Revised%20Edition%202011.pdf> (Last accessed on 15 February 2017).
- GoR (Government of Rajasthan), 2002. Rajasthan State Water Policy. State Water Resource Planning Department, Jaipur, Rajasthan, India, Jaipur, Rajasthan.
- Gray, E., Sriniidhi, A., 2013. Watershed Development in India: Economic Valuation and Adaptation Considerations. WRI Working Paper. World Resources Institute, Washington DC, USA.
- Gupta, S., 2014. Worlds apart? Challenges of multi-agency partnership in participatory watershed development in Rajasthan, India, India. *Dev. Stud. Res.* 1 (1), 100–112.
- Hallegatte, S., 2009. Strategies to adapt to an uncertain climate change. *Glob. Environ. Change* 19 (2), 240–247.
- Hope, R.A., 2007. Evaluating social impacts of watershed development in India. *World Dev.* 35, 1436–1449.
- IPCC, 2014. Annex II: glossary. In: Barros, V.R. (Ed.), *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (1757–1776)*. Cambridge University Press, Cambridge, United Kingdom.
- Jones, H.P., Hole, D.G., Zavaleta, E.S., 2012. Harnessing nature to help people adapt to climate change. *Nat. Clim. Change* 2 (7), 504–509.
- Joshi, P.K., Jha, A.K., Wani, S.P., Sreedevi, T.K., Shaheen, F.A., 2008. Impact of Watershed Program and Conditions for Success: A Meta-Analysis Approach. Global Theme on Agroecosystems Report No. 46. International Crops Research Institute for the Semi-Arid Tropics, Andhra Pradesh, India.
- Kerr J., G. Pangare, V.L., 2002. Pangare Watershed development projects in India: an evaluation Research Report 127, International Food Policy Research Institute, Washington DC, 90.
- Kerr, J., 2001. Watershed project performance in India: conservation, productivity, and equity. *Am. J. Agric. Econ.* 83, 1223–1230.
- Kerr, J., George, P., Pangare, G., Pangare, V.L., 2000. An Evaluation of Dryland Watershed Development Projects in India. EPTD Discussion Paper 68. International Food Policy Research Institute, Washington, DC, USA.
- Kolavalli, S., Kerr, J., 2002. Scaling up participatory watershed development in India. *Dev. Change* 33, 213–235.
- Kumar, S., Corbridge, S., 2002. Programmed to Fail? Development Projects and the Politics of Participation. *J. Dev. Stud.* 39 (2), 73–103.
- Lahiri-Dutt, K., Wasson, R.J., 2008. *Water First: Issues and Challenges for Nations and Communities in South Asia*. SAGE Publications, India, New Delhi, India.
- Leach, M., Mearns, R., Scoones, I., 1999. Environmental entitlements: dynamics and institutions in community-based natural resource management. *World Dev.* 27 (2), 225–247.
- Mall, R., Gupta, A., Singh, R., Singh, R., Rathore, L., 2006a. Water resources and climate change: an Indian perspective. *Curr. Sci.* 90, 1610–1626.
- MoA (Ministry of Agriculture), 2007. Report of the Workshop on Setting up a “Mechanism for Continuous and Integrated Drought Management”. Drought Management Division. Department of Agriculture and Cooperation, Ministry of Agriculture, New Delhi, India.
- MoEF (Ministry of Environment and Forests), 2012. India’s Second National Communication to the United Nations Framework Convention on Climate Change. Government of India, New Delhi, India.
- Mollinga, P.P., 2010. The material conditions of a polarized discourse: clamours and silences in critical analysis of agricultural water use in India. *J. Agrar. Change* 10, 414–436.
- Ministry of Rural Development (MoRD), 2010. Annual Report (2009–2010). Ministry of Rural Development. Government of India, New Delhi, India.
- Narain, P., Rao, A., Abrol, I., 2010. Managing Droughts and Desertification in India—lessons from the Past and Future Strategies. Central Arid Zone Research Institute, Jodhpur, India.
- Narayanan, N., Kamath, L., 2012. Rural water access: governance and contestation in a semi-arid watershed in Udaipur, Rajasthan. *Econ. Political Wkly.* 47, 65.
- Raj, R., Pasupati, P., 2012. Assessing Changes in Natural Resources Status and Livelihoods of the Tribal Community and Appraising the Institutional Mechanism for Sustainable Management of Natural Resources. Tata-Dhan Academy, Tamil Nadu, India.
- Rajesh, 2000. Drought, Debt and Poverty. *Econ. Political Wkly.* 35, 2101–2104.
- Ratna Reddy, V., Gopinath Reddy, M., Galab, S., Soussan, J., Springate-Baginski, O., 2004. Participatory watershed development in India: can it sustain rural livelihoods? *Dev. Change* 35 (2), 297–326.
- Robbins, P., 2000. The rotten institution: corruption in natural resource management. *Political Geogr.* 19, 423–443.
- Samra, J.S., Sharma, K.D., 2009. Watershed development: how to make ‘invisible’ impacts ‘visible’? *Curr. Sci.* 96 (2), 203–205.
- Sangameswaran, P., 2008. Community formation, ‘Ideal’ villages and watershed development in western India. *J. Dev. Stud.* 44 (3), 384–408.
- Seeley, J., Batra, M., Sarin, M., 2000. Women’s participation in watershed development in India, Gatekeeper Series No. 92 Sustainable Agriculture and Rural

- Livelihoods Programme. International Institute for Environment and Development (IIED), London, UK.
- Singh, C., 2014. Understanding Water Scarcity and Climate Variability: An Exploration of Farmer Vulnerability and Response Strategies in Northwest India. Ph.D. Thesis. University of Reading, UK.
- Singh, C., Bendapudi, R., Deshpande, T., Solomon, D., 2015. The Adaptation Development Spectrum. Vulnerability and Adaptation to Climate Change in the Semi-Arid Regions of India, ASSAR Project, Cape Town, South Africa.
- Singh, C., Dorward, P., Osbahr, H., 2016. Developing a holistic approach to the analysis of farmer decision-making: implications for adaptation policy and practice in developing countries. *Land Use Policy* 59, 329–343.
- Singh, V.S., Pandey, D.N., Gupta, A.K., Ravindranath, N., 2010. Climate Change Impacts, Mitigation and Adaptation: Science for Generating Policy Options in Rajasthan, India. Climate Change and CDM Cell, Rajasthan State Pollution Control Board, Jaipur, Rajasthan, India.
- Sinha, H., 2015. Revisiting the Participatory Watershed Development Programmes of India. Commons Amidst Complexity and Change, Proceedings of the Fifteenth Biennial Conference of the IASC, Alberta, Canada.
- Sivanna, N., 2009. Guidelines and Watershed Development: Lessons from Karnataka (Working Paper). The Institute for Social and Economic Change, Bangalore, India.
- TERI (The Energy and Resources Institute), 2010. Draft Rajasthan State Action Plan on Climate Change. TERI, New Delhi, India <<http://www.nicra-icar.in/nicrarevised/images/Stat%20Action%20Plan/Rajasthan-SAPCC.pdf>> Last accessed on 10 February 2017.
- Thomas, D., Twyman, C., Osbahr, H., Hewitson, B., 2007. Adaptation to climate change and variability: farmer responses to intra-seasonal precipitation trends in South Africa. *Climatic Change* 83 (3), 301–322.
- Wani, S.P., Joshi, P., Raju, K., Sreedevi, T., Wilson, J., Amita, S., Diwakar, P., Palanisami, K., Marimuthu, S., Jha, A., 2008. Community Watershed as a Growth Engine for Development of Dryland Areas: A Comprehensive Assessment of Watershed Programs in India. International Crops Research Institute for the Semi-Arid Tropics, Andhra Pradesh, India.